

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)



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Applicant's or agent's file reference <b>IPP7014WOD</b>		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)		WIPO PCT
International application No. <b>PCT/GB 02/05938</b>	International filing date (day/month/year) <b>30.12.2002</b>	Priority date (day/month/year) <b>09.01.2002</b>		
International Patent Classification (IPC) or both national classification and IPC <b>H04R23/00</b>				
Applicant <b>QINETIQ LIMITED et al.</b>				

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 3 sheets.

- This report contains indications relating to the following items:

- |      |                                     |  |
|------|-------------------------------------|--|
| I    | <input checked="" type="checkbox"/> | Basis of the opinion   |
| II   | <input type="checkbox"/>            | Priority   |
| III  | <input type="checkbox"/>            | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability   |
| IV   | <input type="checkbox"/>            | Lack of unity of invention   |
| V    | <input checked="" type="checkbox"/> | Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI   | <input type="checkbox"/>            | Certain documents cited  |
| VII  | <input type="checkbox"/>            | Certain defects in the International application   |
| VIII | <input type="checkbox"/>            | Certain observations on the International application  |

Date of submission of the demand  <b>19.05.2003</b>	Date of completion of this report  <b>02.03.2004</b>
Name and mailing address of the International preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Petitpierre, O  Telephone No. +49 89 2399-2748  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/GB 02/05938**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-9 as originally filed

**Claims, Numbers**

1-18 received on 07.02.2004 with letter of 03.02.2004

**Drawings, Sheets**

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-18
	No: Claims	
Inventive step (IS)	Yes: Claims	1-18
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-18
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**1 Support of the amended claims (Article 34(2)(b) PCT)**

The present set of 18 claims is based as follows on the originally filed set of 28 claims:

- present independent claim 1 combines the features of originally filed claims 1 and 2;
- present dependent claims 3 to 10 correspond to originally filed claims 5 to 12;
- present independent claim 11 combines the features of originally filed claims 13 and 14;
- present dependent claims 12 to 17 correspond to originally filed claims 16 to 20 and 23; and
- present independent claim 18 combines the features of originally filed claim 24 with a feature of originally filed claim 2.

**2 Unity of invention (Article 13.1 PCT)**

The essential feature of the invention is the use of a fiber laser as acoustic sensor. This feature is recited in all three independent claims 1, 11, and 18.

**3 Novelty and inventive step (Article 33 PCT)**

The feature of using a fiber laser is not disclosed or even suggested in any of the prior art documents cited in the International Search Report. Indeed, in all four cited documents, the light emitted by a light source (laser 202 in US-B-6 285 806; light source 88 in US-A-5 367 376; LED 10 in US-A-4 235 113; and light source 10 in US-A-5 363 342) is always modulated in intensity but never in frequency, while the light emitted by radiation source 80 (see Fig. 3B of present application) is used to pump the individual fiber lasers which in turn emit light modulated in frequency by the acoustic waves.

**CLAIMS**

1. A musical instrument sound detection system comprising:  
a fibre optic acoustic sensor;  
a source of electromagnetic radiation optically coupled to said fibre optic acoustic  
5 sensor and operable to input electromagnetic radiation to said fibre optic acoustic  
sensor; and  
an electromagnetic radiation detector arranged to receive electromagnetic radiation  
output from said fibre optic acoustic sensor and operable to detect at least one  
property of said output electromagnetic radiation; wherein  
10 said fibre optic acoustic sensor is responsive to sound generated by a musical  
instrument and is operable to vary said at least one property of said input  
electromagnetic radiation in response to that sound in order to generate the output  
electromagnetic radiation, said electromagnetic radiation detector being operable to  
detect variations in said at least one property of said output electromagnetic radiation  
15 indicative of this sound generated by the musical instrument and to produce output  
signals in response thereto  
characterised in that  
said fibre optic acoustic sensor comprises a fibre laser acoustic sensor, comprising an  
optical fibre doped to provide a doped lasing volume, said fibre having two gratings  
20 provided in said doped volume, said fibre laser acoustic sensor being operable to vary  
a wavelength of said input electromagnetic radiation in response to the sound from the  
musical instrument, and said electromagnetic radiation detector being operable to  
detect variations in wavelength of said output electromagnetic radiation.
- 25 2. A musical instrument sound detection system according to claim 1, wherein  
said optical fibre is coated with polyurethane.
3. A musical instrument sound detection system according to any of the preceding  
30 claims, wherein said fibre optic acoustic sensor comprises attachment means for  
attachment to a musical instrument.

4. A musical instrument sound detection system according to any preceding claim, wherein said musical instrument is a stringed musical instrument.

5. A musical instrument sound detection system according to claim 3 or claim 4, wherein said attachment means are for attachment across the sound hole, to the bridge, body, acoustic chamber or the soundboard of said stringed musical instrument.

6. A musical instrument sound detection system according to any preceding claim, said system further comprising a plurality of fibre optic acoustic sensors, said plurality of fibre optic sensors being arranged in series such that electromagnetic radiation from said source passes through each of said sensors in turn.

7. A musical instrument sound detection system according to claim 6, wherein said plurality of fibre optic acoustic sensors are arranged in series along an optical fibre, the distance between respective sensors being such that individual fibre optic sensors may be arranged on different musical instruments with optical fibre connecting said plurality of sensors.

8. A musical instrument sound detection system according to any preceding claim, said musical instrument sound detection system further comprising a signal processor operable to process said output signals received from said electromagnetic radiation detector and to produce acoustic signals that are compatible with a conventional amplifier and/or sound recording system therefrom.

9. A musical instrument having a musical instrument sound detection system according to any one of claims 1 to 5 attached thereto, wherein said fibre optic acoustic sensor or sensors are arranged to receive sound generated by said musical instrument.

10. A musical instrument according to claim 9, wherein said musical instrument is a solid bodied guitar.

11. A method of detecting sound from at least one musical instrument comprising the steps of:

(i) arranging a fibre optic acoustic sensor to receive sound generated by a musical instrument, the sensor comprising a fibre-laser;

(ii) detecting variations in the output wavelength of the fibre-laser..

12. The method of claim 11, wherein step (i) of said method comprises attaching said fibre optic acoustic sensor to said at least one musical instrument.

13. The method of claim 12, wherein said musical instrument is a stringed musical instrument.

14. The method of claim 13, wherein said fibre optic acoustic sensor is attached to the bridge of said stringed instrument.

15. The method of claim 13, wherein said fibre optic acoustic sensor is attached to the soundboard or body of said stringed instrument.

16. The method of claim 13, wherein said fibre optic acoustic sensor is attached between the sound board and the bridge of said stringed instrument.

17. The method of claim 11, said method further comprising the step of:  
(iii) processing said output signals to produce acoustic signals that are compatible with a conventional amplifier and/or sound recording system.

18. The use of a fibre optic acoustic sensor comprising a fibre-laser within a musical instrument sound detection system to detect the sound generated by at least one musical instrument